Complete Summary

GUIDELINE TITLE

Guidelines for the early management of adults with ischemic stroke. A guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups.

BIBLIOGRAPHIC SOURCE(S)

Adams HP Jr, del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, Grubb RL, Higashida RT, Jauch EC, Kidwell C, Lyden PD, Morgenstern LB, Qureshi AI, Rosenwasser RH, Scott PA, Wijdicks EFM, American Heart Association, American Stroke Association Stroke Council, Clinical Cardiology Council. Guidelines for the early management of adults with ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology [trunc]. Stroke 2007 May;38(5):1655-711. [738 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Adams HP Jr, Adams RJ, Brott T, del Zoppo GJ, Furlan A, Goldstein LB, Grubb RL, Higashida R, Kidwell C, Kwiatkowski TG, Marler JR, Hademenos GJ. Guidelines for the early management of patients with ischemic stroke: a scientific statement from the Stroke Council of the American Stroke Association. Stroke 2003 Apr;34(4):1056-83 and Adams H, Adams R, del Zoppo G, Goldstein LB. Guidelines for the early management of patients with ischemic stroke: 2005 guidelines update: a scientific statement from the Stroke Council of the American Heart Association/American Stroke Association. Stroke 2005 Apr;36:916-23

It is intended that this guideline be fully updated in 3 years.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute ischemic stroke

GUIDELINE CATEGORY

Diagnosis
Management
Prevention
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Neurological Surgery
Neurology

INTENDED USERS

Advanced Practice Nurses
Emergency Medical Technicians/Paramedics
Health Care Providers
Health Plans
Hospitals
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To provide an overview of the current evidence about components of the evaluation and treatment of adults with acute ischemic stroke
- To provide updated recommendations that may be used by physicians who provide acute stroke care within the first hours to time of initial diagnosis, treatment, and initial hospitalization

TARGET POPULATION

Adults with ischemic stroke

INTERVENTIONS AND PRACTICES CONSIDERED

Assessment

1. Prehospital evaluation
    - Brief assessments by emergency medical services (EMS) personnel
    - Use of a stroke identification instrument, such as the Los Angeles or Cincinnati screens
    - Initial management of stroke in the field
    - Development of stroke protocols
2. Emergency evaluation
    - Establishment of a protocol for the emergency evaluation of patients with suspected stroke
    - Designation of an acute stroke team
    - Use of a stroke rating scale (National Institutes of Health Stroke Scale)
    - Hematologic, coagulation, and biochemistry tests
    - Additional tests as indicated
3. Brain and vascular imaging
    - Computed tomography (CT), multimodal CT, multimodal magnetic resonance imaging (MRI)
    - Vascular imaging

Management/Treatment

1. Prehospital management and field treatment
    - Activation of the 9-1-1 system by patients or other members of the public
    - Educational programs to increase public awareness of stroke
    - Educational programs for physicians, hospital personnel, and EMS personnel
    - Rapid transport of patients to the closet facility capable of treating acute stroke for evaluation and treatment (including notification of the receiving Emergency Department)
    - Telemedicine
2. Creation and certification of stroke centers
    - Primary stroke centers
    - Comprehensive stroke centers
3. General supportive care and treatment of acute complications
    - Airway support and ventilatory assistance
    - Supplemental oxygen
    - Treatment of sources of fever with antipyretic medications
    - Cardiac monitoring to screen for atrial fibrillation and other potentially serious cardiac arrhythmias
    - Management of arterial hypertension
    - Correction of hypovolemia and optimization of cardiac output (normal saline)
    - Treatment of hypoglycemia and hyperglycemia
4. Intravenous recombinant tissue plasminogen activator
5. Intra-arterial thrombolysis
6. Administration of anticoagulants/antiplatelet agents
7. Volume expansion
8. Vasodilators
9. Vasopressors (in exceptional circumstances as indicated)
10. Mechanical Embolus Removal in Cerebral Ischemia (MERCI) device for extraction of intra-arterial thrombi (in selected patients)
11. Hospitalization

- Comprehensive specialized stroke care following admission to stroke units, incorporating rehabilitation
- Standardized stroke care order sets
- Early mobilization of less severely affected patients
- Measures to prevent subacute complications
- Assessment of swallowing
- Use of nasogastric, nasoduodenal, or percutaneous endoscopic gastrostomy (PEG) feedings to maintain hydration and nutrition
- Antibiotic treatment of patients with suspected pneumonia or urinary tract infections
- Prevention of deep vein thrombosis
    - Aspirin
    - Subcutaneous anticoagulants (in immobilized patients)
- Treatment of concomitant medical diseases
- Interventions to prevent recurrent stroke
- Intermittent external compression devices
- Indwelling bladder catheters

12. Treatment of acute neurological complications
    - Measures to lessen the risk of edema and close monitoring of the patient for signs of neurological worsening
    - Ventricular drain placement for acute hydrocephalus
    - Decompressive surgical evacuation of a space-occupying cerebellar infarction
    - Treatment of recurrent seizures after stroke
    - Hyperventilation
13. Palliative care
    - Honoring patient's advanced directives
    - Discussion of prognosis and treatment options with family

MAJOR OUTCOMES CONSIDERED

- Stroke-related morbidity and mortality
- Adverse events associated with treatment
- Vascular events following stroke
- Neurologic complications
- Functionality

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The data were collected through a systematic review of the literature. Members of the writing panel were appointed by the American Heart Association Stroke Council's Scientific Statement Oversight Committee and represented different

areas of expertise. The panel reviewed the relevant literature with an emphasis on reports published since 2003.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Level of Evidence

A. Data derived from multiple randomized clinical trials
B. Data derived from a single randomized trial or nonrandomized studies
C. Consensus opinion of experts

Level of Evidence for Diagnostic Recommendation

A. Data derived from multiple prospective cohort studies that used a reference standard applied by a masked evaluator
B. Data derived from a single grade A study or one or more case–control studies or studies that used a reference standard applied by an unmasked evaluator
C. Consensus opinion of experts

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Data were synthesized with the use of evidence tables. The American Heart Association's Levels of Evidence grading algorithm was used to grade each recommendation.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

These guidelines have been developed by a panel of physicians with a broad range of expertise, including vascular neurology, neurocritical care, emergency medicine, neurosurgery, and interventional neuroradiology/endovascular neurosurgery.

Because of the wide scope of the guidelines, the members of the writing panel were assigned primary reviews for individual sections. Then the panel assessed the complete guidelines. If the panel concluded that data supported or did not support the use of a specific intervention, appropriate recommendations were made. In some cases in which definitive data were not available, no specific recommendation was made.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Classification

Class I Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective

Class II Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment

> **Class IIa** The weight of evidence or opinion is in favor of the procedure or treatment
>
> **Class IIb** Usefulness/efficacy is less well established by evidence or opinion

Class III Conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guideline was approved by the American Heart Association Science Advisory and Coordinating Committee January 6, 2007.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions of the recommendation classes (**I, II, III**) and levels of evidence (**A, B, C**) are provided at the end of the "Major Recommendations" field.

Recommendations for Prehospital Management and Field Treatment

The recommendations that follow were not included in the previous guidelines.

Class I Recommendations

1. Activation of the 9-1-1 system by patients or other members of the public is strongly supported because it speeds treatment of stroke (**Class I, Level of Evidence B**). 9-1-1 Dispatchers should make stroke a priority dispatch.
2. To increase the number of patients who can be seen and treated within the first few hours after stroke, educational programs to increase public awareness of stroke are recommended (**Class I, Level of Evidence B**).
3. To increase the number of patients who are treated, educational programs for physicians, hospital personnel, and emergency medical services (EMS) personnel also are recommended (**Class I, Level of Evidence B**).
4. Brief assessments by EMS personnel as outlined in the table below titled "Guidelines for EMS Management of Patients With Suspected Stroke" and in Table 5 of the original guideline document are recommended (**Class I, Level of Evidence B**).
5. The use of a stroke identification algorithm such as the Los Angeles or Cincinnati screens is encouraged (**Class I, Level of Evidence B**).
6. The panel recommends that EMS personnel begin the initial management of stroke in the field, as outlined in the table "Guidelines for EMS Management of Patients With Suspected Stroke" (**Class I, Level of Evidence B**). The development of stroke protocols to be used by EMS personnel is strongly encouraged.
7. Patients should be transported rapidly for evaluation and treatment to the closest institution that provides emergency stroke care as described in the statement (**Class I, Level of Evidence B**). In some instances, this may involve air evacuation. EMS personnel should notify the receiving emergency department (ED) so that the appropriate resources may be mobilized.

Table. Guidelines for EMS Management of Patients With Suspected Stroke

Recommended	Not Recommended
Manage ABCs	Dextrose-containing fluids in nonhypoglycemic patients
Cardiac monitoring	Hypotension/excessive blood pressure reduction
Intravenous access Oxygen (as required if O_2 saturation <92%) Assess for hypoglycemia *Nil per os* (NPO) Alert receiving ED Rapid transport to closest appropriate facility capable of treating acute stroke	Excessive intravenous fluids

Class II Recommendation

1. Telemedicine can be an effective method to provide expert stroke care to patients located in rural areas (**Class IIa, Level of Evidence B**). Additional research and experience on the usefulness of telemedicine are encouraged.

Recommendations for Designation of Stroke Centers

The following recommendations were not included in the prior stroke guidelines.

Class I Recommendations

1. The creation of primary stroke centers (PSCs) is strongly recommended (**Class I, Level of Evidence B**). The organization of such resources will depend on local variables. The design of several community-based PSCs that provide emergency care and that are closely associated with a comprehensive stroke center (CSC), which provides more extensive care, has considerable appeal.
2. The development of CSCs is recommended (**Class I, Level of Evidence C**).
3. Certification of stroke centers by an external body, such as the Joint Commission on Accreditation of Healthcare Organizations, is encouraged (**Class I, Level of Evidence B**). The panel encourages additional medical centers to seek such certification.
4. For patients with suspected stroke, EMS should bypass hospitals that do not have resources to treat stroke and go to the closest facility capable of treating acute stroke (**Class I, Level of Evidence B**).

Recommendations for Emergency Evaluation and Diagnosis of Acute Ischemic Stroke

The recommendations that follow are similar to those included in previous statements except recommendation 1 under Class III.

Class I Recommendations

1. An organized protocol for the emergency evaluation of patients with suspected stroke is recommended (**Class I, Level of Evidence B**). The goal is to complete an evaluation and to decide treatment within 60 minutes of the patient's arrival in an ED. Designation of an acute stroke team that includes physicians, nurses, and laboratory/radiology personnel is encouraged. Patients with stroke should have a careful clinical assessment, including neurological examination.
2. The use of a stroke rating scale, preferably the National Institutes of Health Stroke Scale NIHSS, is recommended (**Class I, Level of Evidence B**). Hospitals (i.e., administration) must provide the necessary resources to use such a scale.
3. A limited number of hematologic, coagulation, and biochemistry tests are recommended during the initial emergency evaluation (see table below titled "Immediate Diagnostic Studies: Evaluation of a Patient With Suspected Acute Ischemic Stroke") (**Class I, Level of Evidence B**).
4. Patients with clinical or other evidence of acute cardiac or pulmonary disease may warrant chest x-ray (**Class I, Level of Evidence B**).
5. An electrocardiogram (ECG) is recommended because of the high incidence of heart disease in patients with stroke (**Class I, Level of Evidence B**).

Table. Immediate Diagnostic Studies: Evaluation of a Patient With Suspected Acute Ischemic Stroke

All patients
Noncontrast brain CT or brain MRI
Blood glucose
Serum electrolytes/renal function tests
ECG
Markers of cardiac ischemia
Complete blood count, including platelet count*
Prothrombin time/international normalized ratio (INR)*
Activated partial thromboplastin time*
Oxygen saturation
Selected patients
Hepatic function tests
Toxicology screen
Blood alcohol level
Pregnancy test
Arterial blood gas tests (if hypoxia is suspected)
Chest radiography (if lung disease is suspected)
Lumbar puncture (if subarachnoid hemorrhage is suspected and CT scan is negative for blood)
Electroencephalogram (if seizures are suspected)

MRI indicates magnetic resonance imaging.

*Although it is desirable to know the results of these tests before giving rtPA, thrombolytic therapy should not be delayed while awaiting the results unless: (1) there is clinical suspicion of a bleeding abnormality or thrombocytopenia, (2) the patient has received heparin or warfarin, or (3) use of anticoagulants is not known.

Class III Recommendations

1. Most patients with stroke do not need a chest x-ray as part of their initial evaluation (**Class III, Level of Evidence B**). *This is a change from the previous guideline.*
2. Most patients with stroke do not need an examination of the cerebrospinal fluid (**Class III, Level of Evidence B**). The yield of brain imaging is very high for detection of intracranial hemorrhage. The clinical course of subarachnoid hemorrhage or acute central nervous system infections usually is distinct from that of ischemic stroke. Examination of the cerebrospinal fluid may be indicated for evaluation of a patient with a stroke that may be secondary to an infectious illness.

Recommendations for Early Diagnosis: Brain and Vascular Imaging

Class I Recommendations

1. Imaging of the brain is recommended before initiating any specific therapy to treat acute ischemic stroke (**Class I, Level of Evidence A**). *This recommendation has not changed from the previous guideline.*
2. In most instances, computed tomography (CT) will provide the information to make decisions about emergency management (**Class I, Level of Evidence A**). *This recommendation has not changed from the previous guideline.*
3. The brain imaging study should be interpreted by a physician with expertise in reading CT or magnetic resonance imaging (MRI) studies of the brain (**Class I, Level of Evidence C**). *This recommendation has been added since the previous guideline.*
4. Some findings on CT, including the presence of a dense artery sign, are associated with poor outcomes after stroke (**Class I, Level of Evidence A**). *This recommendation has not changed from the previous guideline.*
5. Multimodal CT and MRI may provide additional information that will improve diagnosis of ischemic stroke (**Class I, Level of Evidence A**). *This recommendation has been added since the previous guideline.*

Class II Recommendations

1. Nevertheless, data are insufficient to state that, with the exception of hemorrhage, any specific CT finding (including evidence of ischemia affecting more than one third of a cerebral hemisphere) should preclude treatment with recombinant tissue plasminogen activator (rtPA) within 3 hours of onset of stroke (**Class IIb, Level of Evidence A**). *This recommendation has not changed from the previous guideline.*
2. Vascular imaging is necessary as a preliminary step for intra-arterial administration of pharmacological agents, surgical procedures, or endovascular interventions (**Class IIa, Level of Evidence B**). *This recommendation has not changed from the previous guideline.*

Class III Recommendations

1. Emergency treatment of stroke should not be delayed in order to obtain multimodal imaging studies (**Class III, Level of Evidence C**). *This recommendation has been added since the previous guideline.*
2. Vascular imaging should not delay treatment of patients whose symptoms started <3 hours ago and who have acute ischemic stroke (**Class III, Level**

of Evidence B). *This recommendation has been added since the previous guideline.*

Recommendations for General Supportive Care and Treatment of Acute Complications

Class I Recommendations

1. Airway support and ventilatory assistance are recommended for the treatment of patients with acute stroke who have decreased consciousness or who have bulbar dysfunction causing compromise of the airway (**Class I, Level of Evidence C**). *This recommendation has not changed from previous statements.*
2. Hypoxic patients with stroke should receive supplemental oxygen (**Class I, Level of Evidence C**). *This recommendation has not changed since the previous guideline.*
3. It is generally agreed that sources of fever should be treated and antipyretic medications should be administered to lower temperature in febrile patients with stroke (**Class I, Level of Evidence C**). *This recommendation has not changed from previous statements*. Medications such as acetaminophen can lower body temperature modestly, but the effectiveness of treating either febrile or nonfebrile patients to improve neurological outcomes is not established. Additional research on utility of emergency administration of antipyretic medications is under way.
4. General agreement supports the use of cardiac monitoring to screen for atrial fibrillation and other potentially serious cardiac arrhythmias that would necessitate emergency cardiac interventions. It is generally agreed that cardiac monitoring should be performed during the first 24 hours after onset of ischemic stroke (**Class I, Level of Evidence B**). *This recommendation has not changed from previous statements.*
5. The management of arterial hypertension remains controversial. Data to guide recommendations for treatment are inconclusive or conflicting. Many patients have spontaneous declines in blood pressure during the first 24 hours after onset of stroke. Until more definitive data are available, it is generally agreed that a cautious approach to the treatment of arterial hypertension should be recommended (**Class I, Level of Evidence C**). Patients who have other medical indications for aggressive treatment of blood pressure should be treated. *This recommendation has not changed from previous statements.*
6. Patients who have elevated blood pressure and are otherwise eligible for treatment of rtPA may have their blood pressure lowered so that their systolic blood pressure is $\leq$185 mm Hg and their diastolic blood pressure is $\leq$110 mm Hg (**Class I, Level of Evidence B**) before lytic therapy is started. *This recommendation has not changed from previous statements.* If medications are given to lower blood pressure the clinician should be sure that the blood pressure is stabilized at the lower level before treating with rtPA and maintained below 180/105 mm Hg for at least the first 24 hours after intravenous rtPA treatment. Because the maximum interval from stroke onset until treatment with rtPA is short, many patients with sustained hypertension above recommended levels cannot be treated with intravenous rtPA.
7. Until other data become available, consensus exists that the previously described blood pressure recommendations should be followed in patients

undergoing other acute interventions to recanalize occluded vessels, including intra-arterial thrombolysis (**Class I, Level of Evidence C**). *This recommendation has been added since the previous guideline.*

8. It is generally agreed that patients with markedly elevated blood pressure may have their blood pressure lowered. A reasonable goal would be to lower blood pressure by approximately 15% during the first 24 hours after onset of stroke. The level of blood pressure that would mandate such treatment is not known, but consensus exists that medications should be withheld unless the systolic blood pressure is >220 mm Hg or the diastolic blood pressure is >120 mm Hg (**Class I, Level of Evidence C**). *This recommendation has changed from previous statements in that a potential goal for lowering blood pressure is now included.* Research testing the effects of early treatment of arterial hypertension on outcomes after stroke is under way. The panel looks forward to any data that will clarify this management decision.
9. It is generally agreed that the cause of arterial hypotension in the setting of acute stroke should be sought. Hypovolemia should be corrected with normal saline, and cardiac arrhythmias that might be reducing cardiac output should be corrected (**Class I, Level of Evidence C**). *This recommendation was not included in previous statements.* The utility of volume expansion and the use of medications to increase blood pressure to treat ischemic stroke are discussed elsewhere in the present guideline.
10. It is generally agreed that hypoglycemia should be treated in patients with acute ischemic stroke (**Class I, Level of Evidence C**). The goal is to achieve normoglycemia. Marked elevation of blood glucose levels should be avoided. *This recommendation was included in previous statements.*

Class II Recommendations

1. No data are available to guide selection of medications for the lowering of blood pressure in the setting of acute ischemic stroke. The recommended medications and doses included in the table below titled "Approach to Arterial Hypertension in Acute Ischemic Stroke" are based on general consensus (**Class IIa, Level of Evidence C**). *The recommendations in the table have changed from the previous statements.*
2. Evidence from one clinical trial indicates that initiation of antihypertensive therapy within 24 hours of stroke is relatively safe. Thus, it is generally agreed that antihypertensive medications should be restarted at approximately 24 hours for patients who have preexisting hypertension and are neurologically stable unless a specific contraindication to restarting treatment is known (**Class IIa, Level of Evidence B**). *This recommendation was not included in previous statements.*
3. Evidence indicates that persistent hyperglycemia (>140 mg/dL) during the first 24 hours after stroke is associated with poor outcomes, and thus it is generally agreed that hyperglycemia should be treated in patients with acute ischemic stroke. The minimum threshold described in previous statements likely was too high, and lower serum glucose concentrations (possibly >140 to 185 mg/dL) probably should trigger administration of insulin, similar to the procedure in other acute situations accompanied by hyperglycemia (**Class IIa, Level of Evidence C**). *This is a change from previous statements.* Close monitoring of glucose concentrations with adjustment of insulin doses to avoid hypoglycemia is recommended. Simultaneous administration of glucose

and potassium also may be appropriate. The results of ongoing research should clarify the management of hyperglycemia after stroke.

Table. Approach to Arterial Hypertension in Acute Ischemic Stroke

Indication that patient is eligible for treatment with intravenous rtPA or other acute reperfusion intervention
Blood pressure level
Systolic >185 mm Hg or diastolic >110 mm Hg
Labetalol 10 to 20 mg IV over 1 to 2 minutes, may repeat X1;
or
Nitropaste 1 to 2 inches;
or
Nicardipine infusion, 5 mg/h, titrate up by 2.5 mg/h at 5- to 15-minute intervals, maximum dose 15 mg/h; when desired blood pressure attained, reduce to 3 mg/h
If blood pressure does not decline and remains >185/110 mm Hg, do not administer rtPA
Management of blood pressure during and after treatment with rtPA or other acute reperfusion intervention
Monitor blood pressure every 15 minutes during treatment and then for another 2 hours, then every 30 minutes for 6 hours, and then every hour for 16 hours
Blood pressure level
Systolic 180 to 230 mm Hg or diastolic 105 to 120 mm Hg
Labetalol 10 mg IV over 1 to 2 minutes, may repeat every 10 to 20 minutes, maximum dose of 300 mg;
or
Labetalol 10 mg IV followed by an infusion at 2 to 8 mg/min
Systolic >230 mm Hg or diastolic 121 to 140 mm Hg
Labetalol 10 mg IV over 1 to 2 minutes, may repeat every 10 to 20 minutes, maximum dose of 300 mg;
or

Labetalol 10 mg IV followed by an infusion at 2 to 8 mg/min; or Nicardipine infusion, 5 mg/h, titrate up to desired effect by increasing 2.5 mg/h every 5 minutes to maximum of 15 mg/h If blood pressure not controlled, consider sodium nitroprusside

Class III Recommendations

1. Nonhypoxic patients with acute ischemic stroke do not need supplemental oxygen therapy (**Class III, Level of Evidence B**). *This recommendation has not changed from previous statements.*
2. Data on the utility of hyperbaric oxygen are inconclusive, and some data imply that the intervention may be harmful. Thus, with the exception of stroke secondary to air embolization, this intervention is not recommended for treatment of patients with acute ischemic stroke (**Class III, Level of Evidence B**). *This recommendation has changed from previous statements.*
3. Although data demonstrate the efficacy of hypothermia for improving neurological outcomes after cardiac arrest, the utility of induced hypothermia for the treatment of patients with ischemic stroke is not established. At the present time, insufficient evidence exists to recommend hypothermia for treatment of patients with acute stroke (**Class III, Level of Evidence B**). *This recommendation has not changed from previous statements.* Additional research on the safety and efficacy of induced hypothermia for treatment of patients with stroke is under way.

Recommendations for Intravenous Thrombolysis

Class I Recommendations

1. Intravenous rtPA (0.9 mg/kg, maximum dose 90 mg) is recommended for selected patients who may be treated within 3 hours of onset of ischemic stroke (**Class I, Level of Evidence A**). Physicians should review the criteria outlined in the table "Characteristics of Patients With Ischemic Stroke Who Could Be Treated With rtPA" (which are modeled on those used in the National Institute of Neurological Disorders and Stroke trial) to determine the eligibility of the patient. A recommended regimen for observation and treatment of the patient is described in the table "Treatment of Acute Ischemic Stroke: Intravenous Administration of rtPA." *This recommendation has not changed from previous statements.*
2. Besides bleeding complications, physicians should be aware of the potential side effect of angioedema that may cause partial airway obstruction (**Class I, Level of Evidence C**). *This recommendation has been added since the previous guidelines.*

Characteristics of Patients With Ischemic Stroke Who Could Be Treated With rtPA

Diagnosis of ischemic stroke causing measurable neurological deficit

The neurological signs should not be clearing spontaneously.
The neurological signs should not be minor and isolated.
Caution should be exercised in treating a patient with major deficits.
The symptoms of stroke should not be suggestive of subarachnoid hemorrhage.
Onset of symptoms <3 hours before beginning treatment
No head trauma or prior stroke in previous 3 months
No myocardial infarction in the previous 3 months
No gastrointestinal or urinary tract hemorrhage in previous 21 days
No major surgery in the previous 14 days
No arterial puncture at a noncompressible site in the previous 7 days
No history of previous intracranial hemorrhage
Blood pressure not elevated (systolic <185 mm Hg and diastolic <110 mm Hg)
No evidence of active bleeding or acute trauma (fracture) on examination
Not taking an oral anticoagulant or, if anticoagulant being taken, INR $\leq$1.7
If receiving heparin in previous 48 hours, aPTT must be in normal range.
Platelet count $\geq$100 000 mm^3
Blood glucose concentration $\geq$50 mg/dL (2.7 mmol/L)
No seizure with postictal residual neurological impairments
CT does not show a multilobar infarction (hypodensity >1/3 cerebral hemisphere).
The patient or family members understand the potential risks and benefits from treatment.

INR indicates international normalized ratio; aPTT, activated partial thromboplastin time.

Treatment of Acute Ischemic Stroke: Intravenous Administration of rtPA

Infuse 0.9 mg/kg (maximum dose 90 mg) over 60 minutes with 10% of the dose given as a bolus over 1 minute.
Admit the patient to an intensive care or stroke unit for monitoring.
Perform neurological assessments every 15 minutes during the infusion and every 30

minutes thereafter for the next 6 hours, then hourly until 24 hours after treatment.

If the patient develops severe headache, acute hypertension, nausea, or vomiting, discontinue the infusion (if rtPA is being administered) and obtain emergency CT scan.

Measure blood pressure every 15 minutes for the first 2 hours and subsequently every 30 minutes for the next 6 hours, then hourly until 24 hours after treatment.

Increase the frequency of blood pressure measurements if a systolic blood pressure is $\geq$180 mm Hg or if a diastolic blood pressure is $\geq$105 mm Hg; administer antihypertensive medications to maintain blood pressure at or below these levels (see table "Approach to Arterial Hypertension in Acute Ischemic Stroke").

Delay placement of nasogastric tubes, indwelling bladder catheters, or intra-arterial pressure catheters.

Obtain a follow-up CT scan at 24 hours before starting anticoagulants or antiplatelet agents.

Class II Recommendations

1. A patient whose blood pressure can be lowered safely with antihypertensive agents may be eligible for treatment, and the physician should assess the stability of the blood pressure before starting rtPA (**Class IIa, Level of Evidence B**). An elevated blood pressure that requires a continuous infusion of sodium nitroprusside may not be sufficiently stable for the patient to receive rtPA. However, because time is limited, most patients with markedly elevated blood pressure cannot be managed adequately and still meet the 3-hour requirement. *This recommendation has not changed from previous guidelines.*
2. A patient with a seizure at the time of onset of stroke may be eligible for treatment as long as the physician is convinced that residual impairments are secondary to stroke and not a postictal phenomenon (**Class IIa, Level of Evidence C**). *This recommendation differs from the previous statements and represents a broadening of eligibility for treatment with rtPA.*

Class III Recommendations

1. The intravenous administration of streptokinase for treatment of stroke is not recommended (**Class III, Level of Evidence A**). *This recommendation has not changed from previous guidelines.*
2. The intravenous administration of ancrod, tenecteplase, reteplase, desmoteplase, urokinase, or other thrombolytic agents outside the setting of a clinical trial is not recommended (**Class III, Level of Evidence C**). *This recommendation is new.*

Recommendations for Intra-Arterial Thrombolysis

Class I Recommendations

1. Intra-arterial thrombolysis is an option for treatment of selected patients who have major stroke of <6 hours' duration due to occlusions of the middle cerebral artery (MCA) and who are not otherwise candidates for intravenous rtPA (**Class I, Level of Evidence B**). *This recommendation has not changed since previous guidelines.*
2. Treatment requires the patient to be at an experienced stroke center with immediate access to cerebral angiography and qualified interventionalists. Facilities are encouraged to define criteria to credential individuals who can perform intra-arterial thrombolysis (**Class I, Level of Evidence C**). *This recommendation has been added since previous guidelines.*

Class II Recommendation

1. Intra-arterial thrombolysis is reasonable in patients who have contraindications to use of intravenous thrombolysis, such as recent surgery (**Class IIa, Level of Evidence C**). *This recommendation was not included in the previous guideline.*

Class III Recommendation

1. The availability of intra-arterial thrombolysis should generally not preclude the intravenous administration of rtPA in otherwise eligible patients (**Class III, Level of Evidence C**). *This recommendation has not changed from previous guidelines.*

Recommendations for Anticoagulants

The following recommendations have not changed from previous guidelines.

Class III Recommendations

1. Urgent anticoagulation with the goal of preventing early recurrent stroke, halting neurological worsening, or improving outcomes after acute ischemic stroke is not recommended for treatment of patients with acute ischemic stroke (**Class III, Level of Evidence A**). This recommendation may change if additional data demonstrate the usefulness of very early intravenous administration of anticoagulants for treatment of patients with infarctions secondary to large-artery thrombosis or cardioembolism. Urgent anticoagulation should not be used in lieu of intravenous thrombolysis for treatment of otherwise eligible patients (**Class III, Level of Evidence A**).
2. Urgent anticoagulation is not recommended for patients with moderate to severe strokes because of an increased risk of serious intracranial hemorrhagic complications (**Class III, Level of Evidence A**).
3. Initiation of anticoagulant therapy within 24 hours of treatment with intravenously administered rtPA is not recommended (**Class III, Level of Evidence B**).

Recommendations for Antiplatelet Agents

Class I Recommendation

1. The oral administration of aspirin (initial dose is 325 mg) within 24 to 48 hours after stroke onset is recommended for treatment of most patients (**Class I, Level of Evidence A**). *This recommendation has changed in that a dose of aspirin is now included.*

Class III Recommendations

1. Aspirin should not be considered a substitute for other acute interventions for treatment of stroke, including the intravenous administration of rtPA (**Class III, Level of Evidence B**). *These recommendations have not changed from previous statements.*
2. The administration of aspirin as an adjunctive therapy within 24 hours of thrombolytic therapy is not recommended (**Class III, Level of Evidence A**). *This recommendation has not changed.*
3. The administration of clopidogrel alone or in combination with aspirin is not recommended for the treatment of acute ischemic stroke (**Class III, Level of Evidence C**). *This recommendation was not included in the previous statement.* The panel supports research testing the usefulness of emergency administration of clopidogrel in the treatment of patients with acute stroke.
4. Outside the setting of clinical trials, the intravenous administration of antiplatelet agents that inhibit the glycoprotein IIb/IIIa receptor is not recommended (**Class III, Level of Evidence B**). *This recommendation has been added since the last guideline was published.*

Recommendations for Volume Expansion, Vasodilators, and Induced Hypertension

A. **Hemodilution in Acute Ischemic Stroke**

Class III Recommendation

1. Hemodilution with or without venesection and volume expansion is not recommended for treatment of patients with acute ischemic stroke (**Class III, Level of Evidence A**). *This recommendation has not changed since the previous guidelines were published.*

B. **Vasodilators in Acute Ischemic Stroke**

Class III Recommendation

1. The administration of medications such as pentoxifylline is not recommended for treatment of patients with acute ischemic stroke (**Class III, Level of Evidence A**). *This recommendation has not changed since the previous guideline was published.*

C. **Induced Hypertension for the Management of Acute Ischemic Stroke**

Class I Recommendation

1. In exceptional cases, a physician may prescribe vasopressors to improve cerebral blood flow. If drug-induced hypertension is used,

close neurological and cardiac monitoring is recommended (**Class I, Level of Evidence C**). *This recommendation has been added since the previous guideline was published.*

Class III Recommendation

1. Drug-induced hypertension, outside the setting of clinical trials, is not recommended for treatment of most patients with acute ischemic stroke (**Class III, Level of Evidence B**). *This recommendation has been added since the previous guideline was published.*

Recommendations for Surgical Interventions

Data on the safety and effectiveness of carotid endarterectomy and other operations for treatment of patients with acute ischemic stroke are not sufficient to permit a recommendation. Surgical procedures may have serious risks and may not favorably alter the outcome of the patient.

Recommendations for Endovascular Interventions

Class II Recommendations

1. Although the Mechanical Embolus Removal in Cerebral Ischemia (MERCI) device is a reasonable intervention for extraction of intra-arterial thrombi in carefully selected patients, the panel also recognizes that the utility of the device in improving outcomes after stroke is unclear (**Class IIb, Level of Evidence B**). *This recommendation has been added since the previous guideline.* The panel also recommends that the device be studied in additional clinical trials that will define its role in the emergency management of stroke. *This is the first time that a panel has made a recommendation about endovascular treatment of patients with acute ischemic stroke.*
2. The usefulness of other mechanical endovascular treatments is not established (**Class IIb, Level of Evidence C**). These devices should be used in the setting of clinical trials. *This recommendation has not changed from previous guidelines.*

Recommendation for Combination Reperfusion Therapy in Acute Stroke

Class III Recommendation

1. At present, combinations of interventions to restore perfusion cannot be recommended outside the setting of clinical trials (**Class III, Level of Evidence B**). *This recommendation has been added since the previous guidelines were published.*

Recommendation for Neuroprotective Agents

Class III Recommendation

1. At present, no intervention with putative neuroprotective actions has been established as effective in improving outcomes after stroke, and therefore

none currently can be recommended (**Class III, Level of Evidence A**). *This recommendation has not changed from previous guidelines.*

Recommendations for Admission to the Hospital and General Acute Treatment (After Hospitalization)

Class I Recommendations

1. The use of comprehensive specialized stroke care (stroke units) incorporating rehabilitation is recommended (**Class I, Level of Evidence A**). *This recommendation is unchanged from the previous guideline.*
2. The use of standardized stroke care order sets is recommended to improve general management (**Class I, Level of Evidence B**). *This recommendation was not in previous guidelines.*
3. Early mobilization of less severely affected patients and measures to prevent subacute complications of stroke are recommended (**Class I, Level of Evidence C**). *This recommendation is unchanged from the previous guideline.*
4. Assessment of swallowing before starting eating or drinking is recommended (**Class I, Level of Evidence B**). *This recommendation is new.*
5. Patients with suspected pneumonia or urinary tract infections should be treated with antibiotics (**Class I, Level of Evidence B**). *This recommendation is similar to previous guidelines.*
6. Subcutaneous administration of anticoagulants is recommended for treatment of immobilized patients to prevent deep vein thrombosis (**Class I, Level of Evidence A**). The ideal timing for starting these medications is not known. *This recommendation is unchanged from the previous guideline.*
7. Treatment of concomitant medical diseases is recommended (**Class I, Level of Evidence C**). *This recommendation is unchanged from the previous guideline.*
8. Early institution of interventions to prevent recurrent stroke is recommended (**Class I, Level of Evidence C**). *This recommendation is similar to previous guidelines.*

Class II Recommendations

1. Patients who cannot take food and fluids orally should receive nasogastric, nasoduodenal, or percutaneous endoscopic gastrostomy (PEG) feedings to maintain hydration and nutrition while undergoing efforts to restore swallowing (**Class IIa, Level of Evidence B**). The timing of the placement of a PEG is uncertain. *This recommendation is new.*
2. Aspirin is a potential intervention to prevent deep vein thrombosis but is less effective than anticoagulants (**Class IIa, Level of Evidence A**). *This recommendation has been strengthened.*
3. The use of intermittent external compression devices is recommended for treatment of patients who cannot receive anticoagulants (**Class IIa, Level of Evidence B**). *This recommendation is unchanged from the previous guideline.*

Class III Recommendations

1. Nutritional supplements are not needed (**Class III, Level of Evidence B**). *This recommendation is new.*
2. Prophylactic administration of antibiotics is not recommended (**Class III, Level of Evidence B**). *This recommendation is new.*
3. If possible, the placement of indwelling bladder catheters should be avoided because of the associated risk of urinary tract infections (**Class III, Level of Evidence C**). Some patients may need prolonged catheter drainage of the bladder, and measures to lower risk of infection should be taken. *This recommendation is similar to previous guidelines.*

Recommendations for Treatment of Acute Neurological Complications

Class I Recommendations

1. Patients with major infarctions affecting the cerebral hemisphere or cerebellum are at high risk for complicating brain edema and increased intracranial pressure. Measures to lessen the risk of edema and close monitoring of the patient for signs of neurological worsening during the first days after stroke are recommended (**Class I, Level of Evidence B**). *This recommendation has not changed since the previous guidelines.* Because many hospitals may not have neurosurgical expertise, transfer of patients at risk for malignant brain edema to an institution that has such expertise should be considered. *This recommendation is new.*
2. Patients with acute hydrocephalus secondary to an ischemic stroke most commonly affecting the cerebellum can be treated with placement of a ventricular drain (**Class I, Level of Evidence B**). *This recommendation has not changed since the previous guidelines.*
3. Decompressive surgical evacuation of a space-occupying cerebellar infarction is a potentially life-saving measure, and clinical recovery may be very good (**Class I, Level of Evidence B**). Although data from clinical trials are not available, it is recommended for patients with major cerebellar infarction. *This recommendation has not changed since the previous guidelines.*
4. Recurrent seizures after stroke should be treated in a manner similar to other acute neurological conditions (**Class I, Level of Evidence B**). *This recommendation has not changed since the previous guidelines.*

Class II Recommendations

1. Although aggressive medical measures, including osmotherapy, have been recommended for treatment of deteriorating patients with malignant brain edema after large cerebral infarction, these measures are unproven (**Class IIa, Level of Evidence C**). Hyperventilation is a short-lived intervention. Medical measures may delay decompressive surgery. *This recommendation has not changed since the previous guidelines.*
2. Decompressive surgery for malignant edema of the cerebral hemisphere may be life-saving, but the impact of morbidity is unknown. Both the age of the patient and the side of the infarction (dominant versus nondominant hemisphere) may affect decisions about surgery. Although the surgery may be recommended for treatment of seriously affected patients, the physician should advise the patient's family about the potential outcomes, including survival with severe disability (**Class IIa, Level of Evidence B**). *This recommendation has been modified.*

3. No specific recommendation is made for treatment of patients with asymptomatic hemorrhagic transformation after ischemic stroke (**Class IIb, Level of Evidence C**). *This recommendation is new.* Treatment of symptomatic hemorrhagic transformation is addressed in the intracerebral hemorrhage management guideline being issued contemporaneously with this statement. Measures to lessen the likelihood of hemorrhagic complications of thrombolytic agents or other interventions to restore or improve perfusion such as careful control of arterial blood pressure are recommended.

Class III Recommendations

1. Because of lack of evidence of efficacy and the potential to increase the risk of infectious complications, corticosteroids (in conventional or large doses) are not recommended for treatment of cerebral edema and increased intracranial pressure complicating ischemic stroke (**Class III, Level of Evidence A**). *This recommendation has not changed since the previous guidelines.*
2. Prophylactic administration of anticonvulsants to patients with stroke but who have not had seizures is not recommended (**Class III, Level of Evidence C**). *This recommendation has not changed since the previous guidelines.*

Palliative Care

Unfortunately, some patients with stroke have a fatal brain injury. These critically ill persons have profound neurological impairments such as a persistent vegetative state or evidence of unstable vital signs. Other patients with stroke have serious preexisting medical or neurological illnesses, such as dementia, that have caused severe impairments, and the new cerebrovascular event may add more disability. Despite the interventions that are described in this outline, the prognosis of such patients often is very poor. Many people would not want to survive if a devastating stroke would lead to a persistent vegetative state or other condition of devastating incapacity.

An increasing number of patients have advanced directive statements that provide instructions about emergency treatment in a situation such as a massive stroke. Physicians should honor those directives. In other circumstances, such directives may not be available, and the patient's neurological status usually precludes decision making. Occasionally, a guardian with medical power of attorney can make the decision. Otherwise, the physician should involve family members. The physician should provide clear information about the nature of the stroke, the prognosis, and the treatment options. The family should be given the opportunity to select or withhold medical interventions. In such situation, the medical care may emphasize measures to keep the patient comfortable and to support the family during the terminal aspects of the stroke.

Definitions:

Classification

Class I Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective

Class II Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment

Class IIa The weight of evidence or opinion is in favor of the procedure or treatment

Class IIb Usefulness/efficacy is less well established by evidence or opinion

Class III Conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful

Level of Evidence

A. Data derived from multiple randomized clinical trials
B. Data derived from a single randomized trial or nonrandomized studies
C. Consensus opinion of experts

Level of Evidence for Diagnostic Recommendation

A. Data derived from multiple prospective cohort studies that used a reference standard applied by a masked evaluator
B. Data derived from a single grade A study or one or more case–control studies or studies that used a reference standard applied by an unmasked evaluator
C. Consensus opinion of experts

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate diagnosis and early management of patients with ischemic stroke

POTENTIAL HARMS

- Aggressive treatment of blood pressure may lead to neurological worsening by reducing perfusion pressure to ischemic areas of the brain.
- The administration of *vasopressors* may be complicated by side effects, including myocardial ischemia, in some patients with stroke.

- Treatment of increased intracranial pressure may result in a decline in arterial blood pressure.
- Early administration of *antihypertensive agents* to patients with systolic blood pressures >180 mm Hg was associated with a marked increase in likelihood of early deterioration, poor neurological outcome, or death.
- Because the risk of hemorrhage is considerable among patients with severe deficits, the decision to treat with *recombinant tissue plasminogen activator (rtPA)* should be made with caution. Treatment with rtPA is associated with symptomatic intracranial hemorrhage, which may be fatal. Besides a risk of intracranial hemorrhage, other potential adverse experiences include systemic bleeding, myocardial rupture if the agent is given within a few days of acute myocardial infarction, and reactions such as anaphylaxis or angioedema, although these events are rare.

CONTRAINDICATIONS

CONTRAINDICATIONS

- Seizure in the absence of imaging confirmation of acute ischemia is a relative contraindication for the use of recombinant tissue plasminogen activator (rtPA) in acute ischemic stroke.
- Patient contraindications to magnetic resonance imaging (MRI) include claustrophobia, cardiac pacemakers, or metal implants.
- A systolic blood pressure >185 mm Hg or a diastolic blood pressure >110 mm Hg is a contraindication to intravenous administration of rtPA.
- The presence of asthma would contraindicate the administration of a beta-blocker.
- The administration of anticoagulants or antiplatelet agents is currently contraindicated during the first 24 hours after treatment with intravenous rtPA.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

The present document is a comprehensive guideline statement on the management of patients with acute ischemic stroke that supersedes the prior statement and interim updates.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Tool Kits

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

End of Life Care
Getting Better
Living with Illness

IOM DOMAIN

Effectiveness
Safety
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Adams HP Jr, del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, Grubb RL, Higashida RT, Jauch EC, Kidwell C, Lyden PD, Morgenstern LB, Qureshi AI, Rosenwasser RH, Scott PA, Wijdicks EFM, American Heart Association, American Stroke Association Stroke Council, Clinical Cardiology Council. Guidelines for the early management of adults with ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology [trunc]. Stroke 2007 May;38(5):1655-711. [738 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

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GUIDELINE DEVELOPER(S)

American Heart Association - Professional Association
American Stroke Association - Disease Specific Society

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American Heart Association

GUIDELINE COMMITTEE

American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council

Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire that all members of the writing group are required to complete and submit. A relationship is considered to be "Significant" if (1) the person receives $10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (2) the person owns 5% or more of the voting stock or share of the entity, or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "Modest" if it is less than "Significant" under the preceding definition.

*Modest.

†Significant

Reviewer Disclosures

Reviewer	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultar Bo
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Ralph Sacco	Columbia University	NINDS grants for stroke research†	None	None	None	None	None
Stanley Tuhrim	Mount Sinai Medical Center	None	None	None	None	None	None

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†Significant.

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Adams HP Jr, Adams RJ, Brott T, del Zoppo GJ, Furlan A, Goldstein LB, Grubb RL, Higashida R, Kidwell C, Kwiatkowski TG, Marler JR, Hademenos GJ. Guidelines for the early management of patients with ischemic stroke: a scientific statement from the Stroke Council of the American Stroke Association. Stroke 2003 Apr;34(4):1056-83 and Adams H, Adams R, del Zoppo G, Goldstein LB. Guidelines for the early management of patients with ischemic stroke: 2005 guidelines update: a scientific statement from the Stroke Council of the American Heart Association/American Stroke Association. Stroke 2005 Apr;36:916-23

It is intended that this guideline be fully updated in 3 years.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American Heart Association Web site.

Print copies: Available from the American Heart Association, Public Information, 7272 Greenville Ave, Dallas, TX 75231-4596; Phone: 800-242-8721

AVAILABILITY OF COMPANION DOCUMENTS

Get With the Guidelines (GWTG) provides disease-specific process documents and tools for in-house quality improvement. See the American Heart Association Web site for more information. See the related QualityTool summary on the Health Care Innovations Exchange Web site for this related tool set.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI Institute on July 26, 2007. The information was verified by the guideline developer on August 23, 2007.

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